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PICKERING 1987

AIR QUALITY SURVEY IN THE VICINITY OF THE BROCK WEST LANDFILL AREA PICKERING, ONTARIO MARCH & APRIL 1987

ARB-115-87-AQM

September, 1987

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Ministry
of the
Environment
Ontario

E. PICHÉ, Director
Air Resources Branch

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AIR QUALITY SURVEY
in the vicinity of the

Brock West Landfill Area
Pickering, Ontario

March & April 1987

ARB-115-87-AQM

Prepared for:

The Central Region
Ontario Ministry of the Environment

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September 1987

EXECUTIVE SUMMARY

At the request of the Central Region, Mobile Air Monitoring Unit #2 of the Air Resources Branch undertook an ambient air quality survey in the vicinity of the Brock West Landfill site in Pickering from March 24 to April 1, 1987.

The main objectives of this survey were: (1) to establish air quality parameters in the vicinity of the Brock West Landfill site; (2) to perform active monitoring during the periods of odours; (3) to attempt to identify the odour(s); and (4) to acquire air quality data downwind of the new landfill gas burner complex at times when Mann Testing Laboratories Limited were performing environmental and characterization tests on one of the burners contained therein.

On several occasions, a discernible bad-smelling odour of decomposing garbage was detected by the Ministry staff while at the Liverpool/Halsey Lane area and at the Pickering Public Works yard at the west end of Dersan Street. This odour was offensive at times but the specific identity of the compounds causing these odours was not determined since no appreciable concentrations of total reduced sulphur compounds or any of the 141 specific organics were measured at either locale. However, measurements taken one metre above a manhole on Valley Farm Road near the Third Concession at a time when similar but stronger odours were present, did reveal elevated concentrations of total reduced sulphur compounds and some aromatic organics.

From the data acquired during this survey, no applicable Ministry of the Environment Air Quality Standards, Criteria or Guidelines were exceeded for any of the measured contaminants.

SOMMAIRE

À la demande de la Région du Centre, l'unité mobile de surveillance de l'air n° 2 de la Direction des ressources atmosphériques a procédé à une étude de la qualité de l'air ambiant dans les environs de la décharge Brock West à Pickering, du 24 mars au 1^{er} avril 1987.

Cette étude avait pour principaux objectifs : (1) de fixer des coefficients de qualité de l'air dans les environs de la décharge Brock West, (2) de procéder à une surveillance active pendant les périodes d'émission d'odeurs, (3) d'essayer de déterminer les odeurs et (4) de recueillir des données sur la qualité de l'air sous le vent du complexe d'incinération au gaz de la nouvelle décharge, au moment où Mann Testing Laboratories Limited procédait à des essais environnementaux sur l'un de ses incinérateurs.

À plusieurs occasions, une mauvaise odeur perceptible d'ordures en décomposition avait été détectée par le personnel du Ministère travaillant dans le secteur de Liverpool/Halsey Lane et au dépôt de voirie de Pickering à l'extrémité ouest de la rue Dersan. Cette odeur était parfois désagréable mais on ignorait la nature précise des composés qui en étaient responsables, car on n'avait mesuré aucune concentration sensible de composés du soufre réduit ni d'aucune des 141 substances organiques à ces sites. Cependant, des mesures effectuées un mètre au-dessus d'une bouche d'égout du chemin Valley Farm, tout près de la troisième concession, à un moment où l'on sentait des odeurs analogues mais plus fortes, ont révélé des concentrations élevées de composés du soufre réduit et la présence de certaines substances organiques aromatiques.

D'après les données recueillies dans le cadre de cette étude, la concentration des contaminants mesurés ne dépassait en aucun cas les normes, critères ou lignes directrices applicables du ministère de l'Environnement en ce qui concerne la qualité de l'air ambiant.

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Abbreviations used in this survey report:

BTX	Benzene, Toluene and Xylenes		
CCs	Common Contaminants	n.a.	Not available
CH4	Methane	n.d.	Not detected
CO	Carbon Monoxide	NO	Nitric Oxide
Dwnwd	Downwind	NOx	Oxides of Nitrogen
GC	Gas Chromatograph	NO2	Nitrogen Dioxide
i.e.	That is	O3	Ozone
km/hr	Kilometres per hour	ppm	Parts per million
MAMU	Mobile Air Monitoring Unit	SO2	Sulphur Dioxide
ml/min	Millimetres per minute	THC	Total Hydrocarbons
MP	Monitoring Period	TH-M	Non-methane Hydrocarbons
MSD	Mass Selective Detector	ug/m3	Micrograms per cubic metre
N/A	Not Applicable		

1.0 Background and Introduction

For two weeks in May of 1984, Mobile Air Monitoring Units (MAMUs) #1 and #3 performed air quality surveys in the vicinity of the Brock West Landfill Site in Pickering, Ontario. The results of that survey were released as Air Resources Publication ARB-027-85-ARSP in February of 1985. At that time, an intensive screening of the gaseous emissions from this landfill site was undertaken by the instrumentation housed in these two MAMUs; namely: continuous ground level concentrations (glc's) of up to 10 common contaminants (CCs) as measured by dedicated analyzers housed in MAMU#1; up to 117 discrete volatile organic compounds (VOCs) (alkanes, aromatics, chlorinated organics, etc.) that could be detected by the on-board gas chromatographic (GC) system of MAMU#1; and other organics (amines, organic sulfides and disulfides, aldehydes, ketones, acetones, alcohols and organic acids) that could be detected by the Trace Atmospheric Gas Analyzer (TAGA 3000) mass spectrometer system of MAMU#3.

The findings of the 1984 study showed that (a) no applicable Ministry of the Environment Air Quality Standard, Criterion or Guideline was exceeded for the monitored contaminants; (b) that the most abundant gaseous contaminants were methane (10 to 20 parts per million (ppm)), xylenes (12 to 130 micrograms per cubic metre (ug/m^3)) and toluene (8 to 84 ug/m^3) as determined by the GC and other analyzers of MAMU#1; and (c) the major compounds detected by the TAGA (of MAMU#3) were acetone, butanone, toluene and xylenes in the concentration range of 5 to 20 parts per billion (ppb) and trace amounts of dimethyl sulphide and dimethyl disulfide which were consistent with the total reduced sulphur results of 10 to 25 ppb.

Additional ambient air monitoring in the vicinity of the Brock West Landfill site was requested by the Central Region and was to be conducted in the spring of 1987. A new landfill gas burner complex was being commissioned at the landfill site and the Metro Toronto Works Department made arrangements with Mann Testing Laboratories to undertake characterization and environmental testing of the third burner unit of this complex during March, 1987. For safety reasons, only one burner unit was operational and ambient air monitoring was specifically requested for the time period in order that comparisons could be made between the two data sets.

Since 1984, a considerable amount of work dedicated specifically to odour control has been carried out at the Brock West Landfill site. Namely, enhanced top and cut filling procedures have been implemented and the gas collection system consisting of wells, trenches and a centralized landfill gas burner complex (which was about 60% complete (operationally) at the time of the 1987 survey) has undergone extensive additions and refinements. Nevertheless, there have been numerous public complaints regarding odours from this landfill site. In 1986, upwards of 600 complaints were registered with the Ministry.

In accordance, the main objectives of the 1987 survey were to: (1) establish air quality parameters in the vicinity of the Brock West Landfill site; (2) perform active monitoring during the periods of odours; (3) attempt to identify the odour(s); (4) and acquire air quality data downwind of the landfill gas burner complex at times when Mann Testing Laboratories Limited was doing its testing.

2.0 The MAMU and Monitoring Programme

The residents of the Town of Pickering expressed concern that a regular workday monitoring programme would NOT cover the hours of maximum occurence of odours (i.e. between 6am and 8am and between 7pm and 9pm). Thus, an active weekday monitoring programme was followed utilizing Mobile Air Monitoring Unit (MAMU) #2 to encompass these times, namely; from 4am to 11am and from 4pm to 11pm. An active monitoring programme infers that staff members were on site; all analyzers were scrutinized and if needed, calibrated; the monitoring unit was moved to the appropriate site(s) (downwind and upwind of source(s)); and that ambient air sampling was being undertaken by ALL instrumentation housed in the monitoring unit. At other times (mainly the weekend), a passive monitoring programme was followed in that the monitoring unit was stationary (at one of two temporary monitoring sites); no staff members were present; and only the continuous gaseous analyzers and meteorological station were measuring air quality parameters.

The most versatile analyzer of MAMU#2 was the dual capillary column gas chromatographic (GC) system which was used for the detection, identification and quantification of up to 141 different VOCs. To detect individual VOCs in ambient air at a concentration level of 1 ug/m^3, ambient air was drawn through a Trace Organic Preconcentrator (TOP) unit for a set period of time - usually one hour. In the TOP, the organics were adsorbed onto a Carbotrap-Spherocarb cartridge and then thermally desorbed and prefocused onto a nickel loop cooled to -195°C with liquid nitrogen. The prefocused organics were then flash vapourized and injected simultaneously onto two 25 metre columns (OV-1, SE-54) where the individual organics were separated and measured by flame ionization detectors. Positive identification of the VOCs was assisted by a computer which compared and correlated the results of the two columns with a library established from prior tests.

The other analytical instruments of MAMU#2 (Table 1) were specific continuous analyzers that could measure the following common contaminants in ambient air.

Oxides of Nitrogen (NO_x)	Nitric Oxide (NO)
Nitrogen Dioxide (NO_2)	Sulphur Dioxide (SO_2)
Total Reduced Sulphur Cpds (TRS)	Carbon Monoxide (CO)
Total Hydrocarbon Cpds (THC)	Methane (CH_4)
Non-methane Hydrocarbons (TH-M)	Ozone (O_3)

A more detailed description of the specific monitoring capabilities of the instruments of MAMU#2 together with the respective detection limits and applicable Ministry of the Environment Air Quality Standards, Criteria, Guidelines and Provisional Guidelines and Threshold Limit Values (TLV) are presented in Tables 1 and 2.

MAMU#2 also contained a complete ground-based meteorological station which could continuously record wind direction and speed, ambient temperature, humidity, solar radiation and barometric pressure data.

Mann Testing Laboratories Limited did not commence testing of the third burner unit until the last week of March (from the evening of March 24 to March 28). The monitoring period implemented by the Air Resources Branch included this test period by commencing on March 24 and continuing until April 1, 1987.

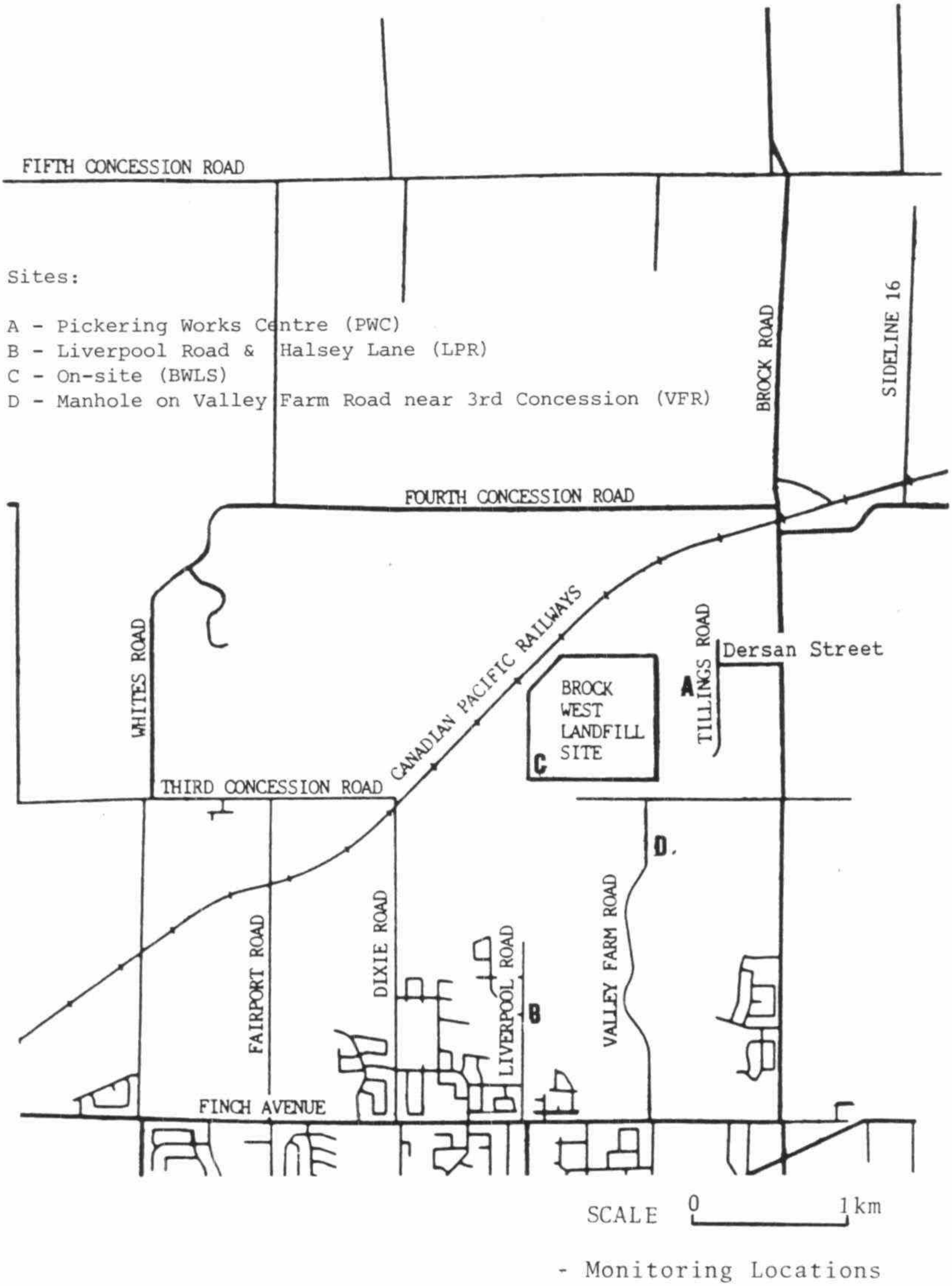
The data set for this study comprised 18 different monitoring periods including 162 hours of common contaminant and ground-based meteorological data and 31 half-hour VOC samples.

As the survey developed, it became obvious that the acquired data set could be discussed under the following four categories: (A) the air quality data acquired at the Pickering Works Centre on Dersan Street; (B) the air quality data acquired in the residential area at Liverpool Road near Halsey Lane; (C) the air quality data acquired on-site and 400 metres downwind of the burner complex; and (D) the air quality as measured one metre above the leachate sewer system manhole near the corner of Valley Farm Road and the Third Concession (Figure 1).

FIGURE 1

BROCK WEST LANDFILL SITE

MONITORING LOCATIONS



3.0 RESULTS AND DISCUSSION

3.1 THE AIR QUALITY DATA as ACQUIRED AT THE PICKERING WORKS CENTRE (at the west end of DERSAN STREET).

The Pickering Works Centre was a semi-permanent monitoring site in that electrical power was supplied so that both active and long-term passive monitoring could be undertaken. The survey programme was conducted at this site on March 24, 26 and 27th. Five monitoring periods (MPs) encompassed these days during which 84 hours of common contaminant and meteorological data and 17 VOC samples were acquired.

On Tuesday March 24, a weakening ridge of high pressure was aligned north-south just east of Lake Ontario. The air mass over Pickering was dry and stable. It was a clear sunny day and the winds were initially light and variable but by early afternoon, they had become easterly at 15 km/hr (kilometres/hour).

This was the first day for this survey and MAMU#2 arrived in the area shortly before 2pm. MAMu#2 moved to the Works Centre and all instruments were calibrated. The Ministry staff visited the burner complex at the landfill site and learned that the Mann Testing Laboratories' testing programme had not commenced but was scheduled to start later that evening. The Ministry staff returned to MAMU#2 and upwind data were acquired at the Pickering Works Centre. Commencing at 3:12pm, over one hour of common contaminant data and three VOC samples were collected at this site (MP B242, Table 3). As noted from the collected data, low ground level concentrations (glc's) were monitored. The respective maximum one-hour average glc's of CO, TRS, THC, SO_2, and NO_x were 0.11, nd (not detected, i.e. the ambient air concentration of TRS was less than 0.002ppm), 1.36, nd (i.e. the ambient air concentration of SO_2 was less than 0.01ppm), and 0.05ppm (Table 4). From the three VOC samples, the total organic concentrations ranged from 48 to 87 ug/m^3 with the alkanes and aromatics comprising approximately 62% and 33% of these totals respectively (Table 5). All of these concentrations values were low and since the Works Centre was upwind of the landfill site on March 24, the collected air quality concentrations were deemed to be indicative of the rural environment in this area.

On Thursday March 26, a low pressure area was centered just north of Lake Huron. Its warm front had pushed through the Pickering area overnight and as a result, the air mass over Pickering was moist and unstable. It was overcast with fog and light rain in the early morning. Because of this frontal passage, the winds were southerly, brisk and veering continuously.

Before 7am, MAMU#2 had been fully calibrated and since the winds were from the westsouthwest at 10 km/hr, the monitoring unit was moved to the Works Centre. It was still overcast and upon arrival at this site, a significant odour of decomposing garbage was detected by the Ministry staff. Since the Works Centre was directly downwind of both the landfill area and burner complex site on March 26, an active monitoring programme was implemented. Commencing at 7:22am, ten VOC samples (one one-half hour sample every hour) and 21.5 hours of common contaminant and meteorological data (MPs B262 and B263) were acquired. (By mid-morning, Mann Testing Laboratories Limited had commenced their characterization studies at the burner complex.)

Although a significant odour was detected by the Ministry staff at this site, this was not reflected by the glc's of TRS. From the data sets of monitoring periods B262 and B263, no total reduced sulphur compounds were detected. That is, if they did exist in the air, they existed in quantities less than the minimal detectable limits of the TRS analyzer (i.e. 0.002ppm). Similarly no SO_2 was detected (the minimal detectable limit for SO_2 was 0.01ppm) and as for the other common contaminants, the maximum one-hour average glc's were: 1.32ppm for CO, 0.153ppm for NO_x and 0.012ppm for O_3 (Table 4). From the ten VOC samples, the total organic concentrations ranged from 84 to 348 ug/m^3 with an average concentration of 198 ug/m^3 (Table 5). On the average, the alkanes and aromatics comprised approximately 53% and 32% of these totals respectively. The more dominant alkanes were propane, pentane and hexane but their average concentrations were all less than 12 ug/m^3. The more dominant aromatics were the BTX's (benzene, toluene and xylenes) with respective average concentrations of 5, 25 and 16 ug/m^3. Twenty-five to 57 different organics were detected in these 10 VOC samples, yet no individual concentration was greater than 55 ug/m^3. Thus from these two data sets, the identity of the odour remained unknown as the measured glc's for the identified gaseous contaminants were all low and no applicable Ministry of the Environment Air Quality Standard, Criterion or Guideline was exceeded or even approached for any of these measurements.

The last day of active monitoring at the Works Centre was Friday March 27 and on this date, a weak north-south orientated ridge of high pressure was situated over Lake Huron. During the early morning, the winds were calm; there was morning fog; and a weak odour of decomposing garbage was discernible at the Works Centre. This weak offensive odour was persistent as the Works Centre was downwind of the landfill site throughout most of the day. The air mass over Pickering was moist and stable and the sky condition was overcast stratocumulus. During the late afternoon, the winds became westsouthwesterly at 5 to 10 km/hr.

Commencing at 5:48am, 2 VOC samples and approximately 3 hours of CC data were acquired. As noted by MP B272, although odours were perceived by the Ministry staff, this was not reflected by the TRS concentrations ('not-detectable' being reported) and low concentrations were measured for the other common contaminants: for example, the maximum one-hour average glc for CO was only 1.03ppm and for NO_x 0.13ppm (Table 4). From the two VOC samples, the total organic concentrations were 314 and 313 ug/m^3 with the alkanes and aromatics comprising 53% and 31% of these totals respectively (Table

5). Again, the more dominant organics were the BTXs with average concentrations of 6 (benzene), 37 (toluene) and 25 (xylenes) ug/m^3. The only other dominant organics were the low boiling alkanes, namely: propane (22ug/m^3) and butane (23 ug/m^3). As with the previous results, the identity of the odour causing contaminant(s) could not be determined from these measurements.

Because calm winds were present during the morning and several odour complaints were received from residents of Pickering in the Liverpool/Finch area, MAMU#2 left the Works Centre for this area shortly before 9am. From the weather prognosis, the winds were expected to be westerly for the weekend. In the late afternoon of March 27, MAMU#2 returned to the Works Centre and was prepared for the weekend monitoring programme.

At the onset of the weekend programme, the weak odour of decomposing garbage was still present at the Works Centre and as a result, two more VOC samples were acquired. Low organic concentrations were determined from these two samples and the total concentrations were only 210 and 277 ug/m^3 with the alkane fraction comprising 57% of these totals and the aromatics 31% (MP B276, Table 5). The more dominant organics detected in these samples were the low boiling alkanes (15 ug/m^3 for propane and 22 ug/m^3 for butane) and the BTXs (9 ug/m^3 for benzene, 24 ug/m^3 for toluene and 18 ug/m^{3}for the xylenes). Apart from the VOC sampling, 58.8 hours of CC data were acquired during this weekend and the data are presented by MP B276 in Table 4. Low glc's were determined as the respective maximum one-hour average glc's of CO, SO_2, $NO_x$and O_3 were only 2.09, 0.016, 0.20 and 0.03 ppm and the overall average glc's for these contaminants were 0.51, 0.005, 0.03 and 0.01 ppm. No TRS was detected at this site during this weekend.

From the air quality data acquired at the Pickering Works Centre on Dersan Street, no applicable Ministry of the Environment Air Quality Standards, Criteria or Guidelines were exceeded or approached for any of the measured gaseous contaminants. From the 14 VOC samples acquired downwind of the landfill site, the total organic concentrations ranged from 84 to 348 ug/m^3 with the alkanes and aromatics comprising approximately 52% and 31% of these totals respectively. From the resulting chromatograms, 78 to 87% of the total peak areas were identified resulting in the identification of 27 to 58 different organics with the more dominant being the BTXs (benzene - up to 10 ug/m^3, toluene - up to 52 ug/m^3 and xylenes - up to 27 ug/m^3). During periods of 'odour'at the Pickering Works Centre, no elevated concentrations of total reduced sulphur compounds or any of the other common contaminants were recorded. It is apparent from these data, that the specific contaminant(s) responsible for the odour could not be identified.

3.2 THE AIR QUALITY DATA as ACQUIRED ON LIVERPOOL ROAD (near HALSEY LANE).

This was the second semi-permanent monitoring site utilized during this survey. Both active and passive monitoring programmes were conducted at this site during March 24, 25, 27, 28, 29, 30 and 31. Ten monitoring periods encompassed this time during which 10 VOC samples and approximately 132 hours of common contaminant and meteorological data were acquired.

On March 24, a weak high pressure ridge was located over Lake Ontario and a nocturnal inversion was expected in the Pickering area. During the early evening, the residents in the Liverpool/Finch area submitted several odour complaints to the Ministry. After 9pm, it was calm, cool and clear and an overnight passive air monitoring programme was initiated (MP B244). From the 7 hours of CC data acquired during this time, no sulphur compounds were detected and the results were generally indicative of a clean urban environment. For example, the maximum one-hour average glc of CO was 0.20ppm, for THC 1.58ppm, for NO_x 0.04ppm, for O_3 0.04ppm and 'not detected' for TRS and SO_2 (Table 4). Some light odour resembling decaying garbage was perceived at approximately 4:30am but since no sulphur compounds were detected, only one VOC sample was acquired. Twenty-six different organics were detected in this sample and the total organic concentration was light (69 ug/m^3) (Table 6). The alkanes comprised 55% of this total and the aromatics 33% with the more dominant organics being propane (13 ug/m^3) and toluene (10 ug/m^3).

During the late morning and early afternoon of March 25, the passive monitoring continued at the Liverpool site. A low pressure area in central States was moving northward and was expected to bring some light rain and overcast conditions to the Pickering area later in the day. The air mass was moist and unstable and around noon, the winds were light southeasterly. Commencing at 11am, approximately 5 hours of common contaminant data were acquired at this site (MP B253) and all measured concentrations were low (Table 4). For example, the maximum one-hour average glc of CO was only 0.91ppm, of NO_x 0.08ppm and of O_3 0.04ppm. No odour was detected at this time and no VOC sample was acquired.

The warm front associated with this low pressure system pushed into the Pickering area overnight and because of this, overcast conditions with some light rain and fog were present. Since the winds were forecasted to be light and variable, MAMU#2 started another passive monitoring programme at 9:40pm (MP B255). Since there were no odour complaints from the residents of Pickering during the evening and no odour was detected by Ministry staff, only common contaminant data were acquired. From the 8 hours of CC data acquired during this night, low concentrations were measured. The maximum one-hour average glc of CO was 0.59ppm, of NO_x 0.06ppm, of O_3 0.03ppm and once again, no TRS or SO_2 were detected (Table 4).

After the overnight monitoring (i.e. MP B255), MAMU#2 did not return to the Liverpool site until the morning of March 27. The low pressure area had pushed off to the east and on March 27, a weak north-south orientated ridge of high pressure situated over Lake Huron was influencing the weather in Pickering. The air mass over Pickering was moist and stable and the winds were forecasted to become light and variable throughout the day.

During the early morning of March 27, several odour complaints were logged with the Ministry - in particular from residents on Fieldstone Circle, Bowler Drive and Timber Court. Ministry staff members investigated and upon arrival at the scene (usually within 15 minutes of the received complaint), the odours had dissipated. Because of these odour complaints and the light and highly variable winds, MAMU#2 moved to the Liverpool site at 9am. No odours were discernible at this time but nevertheless, monitoring of the common contaminants commenced at 9:31am (reference to MP B273). The 6.9 hours of ambient air data showed that low concentrations for the common contaminants were measured (Table 4). There was no odour during this time but nevertheless, at 4:30pm, one VOC sample was acquired. The total organic concentration determined from this sample was 227 ug/m^3 with the alkanes accounting for 57% of this total and the aromatics 34% (MP B273, Table 6). The more dominant organics were the low boiling alkanes (propane at 15 ug/m^3, butane at 22ug/m^3) and toluene at 22 ug/m^3. After 6pm, the winds became more westerly and MAMU#2 moved to the Pickering Works Centre where it was prepared for the weekend passive monitoring programme.

On Monday, March 30, a low pressure area was centered over eastern Quebec and from it, a cold front extended southwesterly over southern Ontario. This cold front was on a line between Barrie and London and was expected to move through Pickering during the afternoon. Behind this front, the temperature was expected to drop below freezing and snow was forecasted for the evening. Before 6am, the winds were light and variable. By 9am, the winds had become northerly and moderate (up to 15 km/hr).

At just after 8am on March 30, MAMU#2 moved from the Pickering Works Centre to the Liverpool site. At 8:33am, the collection of one VOC sample was started and at 9am, the acquisition of 9 hours of common contaminant data commenced (MP B303). Although the monitoring unit was downwind of the landfill site, some contamination of the sampled air by vehicular emissions was unavoidable since the monitoring unit was situated on Liverpool Road. As shown in Table 4, the vehicular contamination was reflected by the higher glc's of CO (its maximum one-hour average and instantaneous glc's were 1.97 and 2.22ppm) and NO_x (0.13 and 0.18ppm). The vehicular emission contamination was also evident in the analysis of the VOC sample. The total organic concentration was 172 ug/m^3 with the alkanes comprising 78% (134 ug/m^3) of this total and the aromatics 10% (18 ug/m^3) (Table 6). The more dominant organics were the low boiling alkanes; propane, butane and pentane. No sulphur compounds were detected during this monitoring period and no odour complaints were received.

Because of the forecasted poor weather and yet northerly winds, MAMU#2 remained at the Liverpool site until the morning of April 1, 1987 - i.e. for the remainder of this air quality survey.

During the evening of March 30, another overnight monitoring programme for the common contaminants was carried out. Monitoring for the common contaminants commenced at 6:17pm (MP B304) and the two half-hour VOC samples were collected starting at 5:52pm and 8:17pm. The Ministry staff travelled extensively in the area but no strong odours were perceived. No odour complaints were logged and upon review of the 11 hours of acquired CC data, all concentrations were found to be low. The respective maximum one-hour average glc's of CO, SO_2, THC, $NO_x$and O_3 were only 0.25, 0.01, 2.88, 0.01 and 0.01ppm (Table 4). No TRS was detected and from the analyses of the two VOC samples, the total organic concentrations were only 16 and 23 ug/m^3 (Table 6).

Upon arrival of the morning staff on March 31, approximately 10 centimeters of snow had fallen overnight. It was still snowing and the temperature was below -2°C. Some freezing rain was mixed with the snow and the weather vane (wind speed and direction) had frozen solid. The winds were light and variable and no odours were present.

All instruments were calibrated and monitoring of the common contaminants commenced at 5:40am (MP B312). This monitoring lasted for approximately one hour and low concentrations were measured. No odour was perceived during this time and the winds remained light and variable.

Another monitoring period was started at 7:22am and ran for the next 10 hours (MP B313). During this time, there were still no odours and the winds continued to be light and variable. Since there were no odours, no VOC samples were acquired. The concentrations for the common contaminants were low. For example, the respective maximum one-hour average glc's for CO, THC, TRS, SO_2, and NO_x were only 0.40, 4.02, nd., nd. and 0.02ppm (Table 4). The hydrocarbon analyzer started to malfunction after 5:30pm and because of this, monitoring was halted.

The ambient temperature was less than -4°C and the wind vane was still frozen. However, another monitoring period was started at 5:42pm (MP B314). This monitoring lasted for approximately 3 hours and all the ground level concentrations were low and similar to those reported for the previous monitoring period (Table 4). At 9pm, another check was made on the analyzers and the hydrocarbon analyzer and the wind vane were still inoperative. At 9:15pm, the final overnight monitoring programme was started (MP B315). As throughout this day, low concentrations for the common contaminants were measured. The respective maximum one-hour average glc's of CO, TRS, SO_2, $NO_x$and O_3 were 2.03, 0.003, nd., 0.08 and 0.01ppm (Table 4).

Although no odours were present, 5 VOC samples were acquired during the evening of March 31. The total organic concentrations determined from these samples were very low; ranging from only 10 to 20 ug/m^3 (Table 6).

3.3 AMBIENT AIR DATA ACQUIRED ON-SITE & DOWNWIND OF BURNER COMPLEX AND LANDFILL AREA

On-site air quality data downwind of the burner complex and landfill area were obtained only during March 25. A low pressure area located in southwestern Iowa was influencing the weather in Pickering on this date. The winds were easterly throughout the day. They were light in the morning and increased to almost 20 km/hr by late afternoon. It was overcast and Mann Testing Laboratories Limited was conducting its tests at the burner complex.

At 8am, MAMU#2 moved onto the Brock West Landfill property and was positioned approximately 300 metres west of and downwind -of the burner complex and landfill site. Commencing at 8:20am, 1.9 hours of common contaminant data were acquired and at 9am, one half-hour VOC sample was collected (MP B252). The winds were light during this time (less than 3 km/hr) and there was a considerable amount of heavy truck traffic between the burner complex and the monitoring unit. Some light and sporadic odours from the burner complex and landfill site were detected by the staff at the monitoring unit. The data acquired would not be representative of emissions from the burner complex and the landfill site because they would be complicated by the emissions from the intervening vehicles. As noted from the common contaminant data, the maximum instantaneous glc's of CO and NO_x were 3.87 and 0.104ppm (vehicular emissions) while the maximum one-hour averages were 0.60 and 0.07ppm (Table 4). For the reduced sulphur compounds, the maximum instantaneous glc was 0.005ppm (burner complex and landfill site) while the maximum one-hour average was just at the detection limit (i.e. 0.002ppm). From the analyses of the VOC sample, the organic concentration was also contaminated by these vehicular emissions. The total organic concentration was 304 ug/m^3 but the major part (over 79% or 232 ug/m^3) was comprised of the alkane fraction with the more dominant organics being propane through hexane with individual concentrations 10 to 70 ug/m^3 (Table 7). Since vehicular emissions were contaminating the air quality downwind of the burner complex and landfill site, the monitoring was terminated shortly before 10am.

MAMU#2 returned to this site around 5pm. The winds had increased to 15 or 20 km/hr and the vehicular traffic had become much less. Another 1.3 hours of common contaminant data (MP B254) and another half-hour VOC sample were collected at this time. As noted from the common contaminants, vehicular emission contamination was much less. The maximum instantaneous glc's of CO and NO_x were now only 0.24 and 0.05ppm and the maximum one-hour average glc's were 0.16 and 0.04ppm (Table 4). No total reduced sulphur compounds or sulphur dioxide were detected at this site. However for total hydrocarbons, the maximum one-hour average concentration was 2.58ppm. Although not presented in Table 4, methane, a component of the total hydrocarbon compounds, had a maximum instantaneous glc reading of 9.86ppm and a maximum one-hour average of 1.97ppm. These high methane readings inferred that this site was directly downwind of the burner complex and the landfill area. No strong or persistant odour of decomposing garbage was discernible at the monitoring unit and as can be seen from the GC analyses, the total organic concentration was low (29 ug/m^3) with only 14 specific organics being identified (Table 7).

3.4 AIR MEASUREMENTS TAKEN ONE METRE ABOVE MANHOLE AT THE CORNER OF VALLEY FARM ROAD AND THE THIRD CONCESSION.

During the early evening of March 24, a very strong odour of decomposing garbage was noted above the first manhole south of the Third Concession on Valley Farm Road. This was the same type of odour as was detected at the Pickering Works Centre and on Liverpool Road, but in this case, it was much stronger. A sampling hose was run from the monitoring unit and placed approximately 1 metre above this manhole. The winds were light and the ambient temperature was approximately 10°C.

Commencing just after 6pm, 2.4 hours of common contaminant data (MP B243) and two half-hour VOC samples were acquired at this site. The measured concentrations were high. For example, the respective maximum instantaneous concentrations of CO, TRS and THC were 46.61, 0.109 and 59.12ppm and their respective maximum one-hour averages were 19.32, 0.015 and 41.02ppm (Table 4). It is interesting to note that no sulphur dioxide was measured at this time, i.e. if there were any sulphur dioxide in the emissions from this manhole, it would have been at concentrations less than the minimum detectable level (0.01ppm) of the analyzer. From the analyses of the two VOC samples, the total organic concentrations were 1551 and 2225 ug/m^3 (Table 7). The alkanes comprised 56% of these concentrations and the aromatics 30%. An average of 60 different organics were detected in these two samples and of these, the more dominant were butane (193 ug/m^3), 2-methylbutane (174 ug/m^3), pentane (111 ug/m^3), 2-methylpentane (81 ug/m^3), hexane (89 ug/m^3), benzene (79 ug/m^3), toluene (203 ug/m^3) and the xylenes (190 ug/m^3).

From these results, the odour above the manhole appears to be due to total reduced sulphur compounds (i.e. one or more of the following: hydrogen sulphide, methyl mercaptan, ethyl mercaptan, dimethyl sulphide, dimethyl disulphide, carbonyl sulphide or carbon disulphide) and/or some aromatic organics. Since this monitoring was essentially an 'in-situ' type of measurement exercise, none of the Ministry of the Environment Standards, Criteria or Guidelines for air quality would be applicable. However, even if they were applicable, the measured concentrations were still less than those established by the Ministry. For example, the point of impingement Standard (a half-hour average) for benzene is 10,000 ug/m^3; for toluene, 2,000 ug/m^3; and for xylenes, 2,300 ug/m^3. The Ministry's one-hour air quality Criterion for CO is 30ppm.

4.0 Summary

Mobile Air Monitoring Unit #2 conducted an ambient air survey in the vicinity of the Brock West Landfill site, in Pickering, from March 24 to April 1, 1987. The main objectives of this survey were to establish air quality parameters in the vicinity of this active landfill site; to perform active monitoring during periods of odours; to attempt to identify the odours; and to acquire air quality data downwind of the landfill gas burner complex at times when Mann Testing Laboratories Limited were conducting their environmental and characterization tests of the third burner unit.

From the 84 hours of monitoring at the Pickering Works Centre, no contaminant concentrations were found to be in exceedance of the Ministry's applicable Air Quality Standards, Criteria or Guidelines. In addition, during periods of odour, no measurable concentrations of total reduced sulphur compounds were recorded. From the 14 gas chromatographic samples acquired downwind of the landfill area, the total organic concentrations ranged from 84 to 348 ug/m^3 with the alkanes and aromatics comprising approximately 52% and 31% of these totals respectively. An average of 47 different organics were detected in these samples and 78 to 87% of the total peak areas were identified. The maximum range for the concentration of any individual organic was only 50 to 60 ug/m^3.

From the 73 hours of monitoring at the Liverpool site near Halsey Lane, no contaminant concentrations were found to be in exceedance of the Ministry's applicable Air Quality Standards, Criteria or Guidelines. During periods of odour at this site, no measureable concentrations of total reduced sulphur compounds were recorded. From the 10 VOC samples acquired at this site, 2 were contaminated by vehicular emissions and as for the other 8, the total organic concentrations were low ranging from 10 to 69 ug/m^3 (an average of only 22 ug/m^3). Again, 72 to 86% of the total peak area from these chromatograms were identified and only 9 to 34 different organics were identified.

On March 25, on-site active monitoring downwind of the burner complex and landfill area was undertaken. (Mann Testing Laboratories Limited were also active with their characterization and environmental monitoring programme on this date.) The monitoring site was approximately 400 metres west of the burner complex. Between the burner complex and the monitoring unit, a considerable amount of vehicular traffic was present. There was no strong or persistent odour detected by the staff at the monitoring unit and monitoring was conducted both in the morning and afternoon. From the 3.2 hours of common contaminant data and 2 half-hour VOC samples acquired during the morning programme, the vehicular emission contamination was obvious with little else being detected. From the afternoon monitoring, only 14 distinct organics were confirmed in the VOC sample and the total organic concentration was only 29 ug/m^3. For the common contaminants, no total reduced sulphur compounds were detected and the maximum one-hour average concentration of total hydrocarbons was 2.58ppm.

During the evening of March 24, sampling was conducted approximately 1 metre above the first manhole south of the Third Concession on Valley Farm Road. Strong odours of decomposing garbage were detected by the staff at this site and high concentrations of carbon monoxide, total hydrocarbons and total reduced sulphur compounds were measured. For these three contaminants, the respective maximum instantaneous concentrations were 46.6, 59.1 and 0.11ppm and their respective maximum one-hour concentrations were 19.3, 41.0 and 0.02ppm. From the analyses of the two gas chromatographic samples collected above this manhole, the total organic concentrations were 1551 and 2225 ug/m^3 with the alkanes comprising 56% of these concentrations and the aromatics 30%. The more dominant individual organics were the low boiling alkanes and aromatics (benzene, toluene and xylenes) with individual concentrations up to 200 ug/m^3. This exercise was an 'in-situ' monitoring study and as such, none of the Ministry's Standards, Criteria or Guidelines for air quality would apply. However, even if they were applicable, the measured concentrations were still less than those established by the Ministry. The odour above this manhole was similar to that detected downwind of the landfill site, however in this case it was much stronger. From these results, it appears that the odours could be composed of some reduced sulphur compounds and/or some aromatic organics.

In conclusion, over a week of air quality monitoring was performed in the vicinity of the Brock West Landfill site and from all of the acquired data, no applicable Ministry of the Environment Air Quality Standards, Criteria or Guidelines were exceeded for any of the measured contaminants. Odour was detected by the staff in the Liverpool/Halsey Lane area and at the Pickering Public Works yard at the west end of Dersan Street. However no appreciable concentrations of total reduced sulphur compounds or any other gaseous contaminant were measured at either locale.

APPENDIX ..... the data

Table 1

THE INSTRUMENTATION OF MOBILE AIR MONITORING UNIT #2

Instrument	Manufacturer	Analytical Technique	Full Scale Sensitivity
THC, CH4, TH-M analyzer	Ingenieur-Produktions-Gruppe Munchen (IPM) RS-t	Dual flame ionization	50 ppm THC (as CH4)
H2S,SO2,NOx sources	Hartmann & Braun Prufgasgenerator	N/A	N/A
TRS analyzer	Monitor Labs 8850 c/w ML 8770	Fluorescence	0.5 ppm H2S
SO2 analyzer	Monitor Labs 8850	Fluorescence	1.0 ppm SO2
NOx, NO2, NO analyzer	Monitor Labs 8840	Chemi-Luminescence	1.0 ppm NOx (as NO2)
CO analyzer	Thermo Electron P48	Gas Filter Correlation	100 ppm CO
O3 analyzer/ source	Dasibi 1003-AAS	UV Absorption	1.0 ppm O3
CO & THC sources	Matheson	Compressed Gas	N/A
Gas Chromatograph	HP 5880 Dual Capillary Column	Flame Ionization Det.	as set per calibrations

Meteorological Instrumentation

Instrument	Manufacturer	Scale
** Wind speed	Lambrecht GmBH	km/hr
** Wind direction	Lambrecht GmBH	degrees
Temperature	Weather Measure (WM) T621	degrees Celsius
Humidity	WM-HM-11P	absolute & %
Barometric pressure	WM-BM70-B242	millibars
Solar Radiation	WM Star Pyranometer	milliwatts/cm2

** These instruments are located on top of a 10 metre retractable tower

Table 2

Characteristics of the Organics Measured by the Gas Chromatographic Systems of MAMU #2

All concentrations are in terms of ug/m^3 (micrograms per cubic metre)

	Detection Limits	Standards, Guidelines or Provisional Guidelines	Criterion	TWA	STEL	Alternate Names
1 PROPANE	0.2					
2 PROPADIENE	0.3					ALLENE
3 PROPYNE	0.3					METHYL ACETYLENE
4 CHLOROMETHANE	0.3	20000 (2)	7000 (A)	105000	205000	METHYL CHLORIDE
5 CYCLOPROPANE	0.3					
6 2-METHYLPROPANE	0.3					ISOBUTANE
7 CHLOROETHENE	0.3	560 (2)	280 (A)	5000	10000	VINYL CHLORIDE; CHLOROETHYLENE
8 2-CHLORO-2METHYLPROPANE	0.3					
9 1-BUTENE	0.3					
10 1,3-BUTADIENE	0.3					
11 BUTANE	0.2			1900000		*n-BUTANE*
12 1-BUTYNE	0.3					ETHYLACETYLENE
13 CHLOROETHANE	0.3			2600000	3250000	ETHYL CHLORIDE
14 3-METHYL-1-BUTENE	0.3					ISOAMYLENE
15 2-METHYLBUTANE	0.3					ISOPENTANE
16 2-METHYL-1-BUTENE	0.3					
17 PENTANE	0.2			1800000	2250000	*N-PENTANE*
18 2-METHYL-1,3-BUTADIENE	0.4					ISOPRENE
19 trans-2-PENTENE	0.2					
20 cis-2-PENTENE	0.2					
21 DICHLOROMETHANE	1.5	100000 (1)	100000 (A)	350000	1740000	METHYLENE CHLORIDE

22	2-METHYL-2-BUTENE	0.3					
23	2,2-DIMETHYLBUTANE	0.2					NEOHEXANE
24	trans-1,2-DICHLOROETHENE	0.3					
25	3-METHYL-1-PENTENE	0.2					
26	4-METHYL-1-PENTENE	0.2					
27	CYCLOPENTANE	0.2					
28	2,3-DIMETHYLBUTANE	0.2					
29	2-METHYLPENTANE	0.2					
30	3-METHYLPENTANE	0.2					
31	1-HEXENE	0.3					
32	cis-1,2-DICHLOROETHENE	0.3			790000	1000000	cis-1,2-DICHLOROETHYLENE; SYM-DICHLOROETHYLENE
33	2-CHLOROBUTANE	0.6					sec-BUTYL CHLORIDE
34	1-CHLORO-2-METHYLPROPANE	0.4					
35	HEXANE	0.3	35000 (2)		180000		*n-HEXANE*
36	CHLOROFORM	2.2	1500 (2)	500 (A)	50000	225000	TRICHLOROMETHANE
37	trans-3-HEXENE	0.3					
38	3-CHLORO-2-METHYLPROPENE	0.3					ISOBUTENYL CHLORIDE
39	METHYLCYCLOPENTANE	0.2					
40	2,4-DIMETHYLPENTANE	0.2					
41	1,2-DICHLOROETHANE	0.2			40000	60000	ETHYLENE CHLORIDE
42	2,2-DIMETHYLPENTANE	0.4					
43	2,2,3-TRIMETHYLBUTANE	0.2					
44	1,1,1-TRICHLOROETHANE	1.0	350000 (1)	115000 (A)	19000000	2450000	METHYL CHLOROFORM
45	1-CHLOROBUTANE	0.4					n-BUTYL CHLORIDE
46	BENZENE	0.2	10000 (1)	3300 (A)	30000	75000	
47	TETRACHLOROMETHANE	0.9	1800 (2)	600 (A)	20000	125000	CARBON TETRACHLORIDE
48	3,3-DIMETHYLPENTANE	0.2					
49	CYCLOHEXANE	0.2	300000 (2)	100000 (A)	1050000	1300000	HEXAHYDROBENZENE
50	2,3-DIMETHYLPENTANE	0.3					
51	2-METHYLHEXANE	0.5					ISOHEPTANE
52	CYCLOHEXENE	0.3			1015000		
53	DIBROMOMETHANE	18.4					METHYLENE DIBROMIDE; METHYLENE BROMIDE
54	1,2-DICHLOROPROPANE	0.6					PROPYLENE CHLORIDE
55	3-METHYLHEXANE	0.5					
56	2,3-DICHLOROPROPENE	0.7			5000	50000	2,3-DICHLOROPROPYLENE
57	TRICHLOROETHENE	0.3	85000 (1)	28000 (A)	270000	1080000	TRICHLOROETHYLENE

58 2,2,4-TRIMETHYLPENTANE	0.2					ISOOCTANE
59 1-HEPTENE	0.3					
60 HEPTANE	0.2			1600000	2000000	*n-HEPTANE*
61 trans-2-HEPTENE	0.3					
62 METHYLCYCLOHEXANE	0.2			1600000	2000000	HEXAHYDROTOLUENE
63 2,2-DIMETHYLHEXANE	0.2					
64 ETHYLCYCLOPENTANE	0.2					
65 4-METHYLCYCLOHEXENE	0.3					
66 2,5-DIMETHYLHEXANE	0.5					
67 1-CHLOROPENTANE	0.4					n-AMYL CHLORIDE; PENTYL CHLORIDE
68 1,1,2-TRICHLOROETHANE	1.1					VINYL TRICHLORIDE
69 2,3,4-TRIMETHYLPENTANE	0.2					
70 TOLUENE	0.2	2000 (1)	2000 (A)	375000	560000	*METHYLBENZENE*; PHENYLMETHANE
71 1,3-DICHLOROPROPANE	0.7			350000	510000	TRIMETHYLENE CHLORIDE
72 2-METHYLHEPTANE	0.2					
73 4-METHYLHEPTANE	0.2					
74 c-1,3-DIMETHYLCYCLOHEXANE	0.2					
75 3-METHYLHEPTANE	0.2					
76 1,2-DIBROMOETHANE	2.1					ETHYLENE DIBROMIDE; ETHYLENE BROMIDE
77 1,1-DIMETHYLCYCLOHEXANE	0.3					
78 1-OCTENE	0.4	150000 (3)	50000 (A)			
79 trans12DIMETHYLCYCLOHEXANE	0.3					*trans-1,2-DIMETHYLCYCLOHEXANE
80 trans-4-OCTENE	0.3					
81 TETRACHLOROETHENE	0.9			335000	1340000	TETRACHLOROETHYLENE; PERCHLOROETHYLENE
82 c-1,4-DIMETHYLCYCLOHEXANE	0.3					
83 OCTANE	0.3			1450000	1800000	*n-OCTANE*
84 trans-2-OCTENE	0.6					
85 cis12DIMETHYLCYCLOHEXANE	0.2					
86 CHLOROBENZENE	0.4			350000		PHENYL CHLORIDE
87 ETHYLCYCLOHEXANE	0.1					
88 1-CHLOROHEXANE	0.5					n-HEXYL CHLORIDE
89 ETHYLBENZENE	0.3	4000 (1)	4000 (A)	435000	545000	
90 m-XYLENE	0.3	2300 (4)	2300 (A)	435000	655000	*1,3-DIMETHYLBENZENE*
91 p-XYLENE	0.3	2300 (4)	2300 (A)	435000	655000	*1,4-DIMETHYLBENZENE*
92 4-METHYLOCTANE	0.3					
93 2-METHYLOCTANE	0.3					

94	3-METHYLOCTANE	0.3					
95	STYRENE	0.5	400 (1)	400 (A)	215000	425000	*ETHENYLBENZENE*; PHENYLETHYLENE; VINYLBENZENE
96	1,4-DICHLOROBUTANE	0.3					
97	o-XYLENE	0.3	2300 (4)	2300 (A)	435000	655000	*1,2-DIMETHYLBENZENE*
98	1,1,2,2-TETRACHLOROETHANE	2.6					ACETYLENE TETRACHLORIDE
99	1,2,3-TRICHLOROPROPANE	1.3			300000	450000	TRICHLOROHYDRIN
100	1-NONENE	0.7					
101	trans-1,4-DICL-2-BUTENE	0.9					
102	NONANE	0.3			1050000	1300000	*n-NONANE*
103	ISOPROPYLBENZENE	0.3	100 (3)	100 (B)			*(1-METHYLETHYL)BENZENE*; CUMENE
104	2-CHLOROTOLUENE	0.3					*2-CHLORO-1-METHYLBENZENE*; o-TOLYL CHLORIDE; o-CHLOROTOLUENE
105	3-CHLOROTOLUENE	0.5					*3-CHLORO-1-METHYLBENZENE*; m-TOLYL CHLORIDE; m-CHLOROTOLUENE
106	4-CHLOROTOLUENE	0.5					*4-CHLORO-1-METHYLBENZENE; p-TOLYL CHLORIDE; p-CHLOROTOLUENE
107	PROPYLBENZENE	0.4					n-PROPYLBENZENE
108	3-ETHYLTOLUENE	0.3					*1-ETHYL-3-METHYLBENZENE*; M-ETHYLTOLUENE
109	4-ETHYLTOLUENE	0.3					*1-ETHYL-4-METHYLBENZENE*; P-ETHYLTOLUENE
110	1,3,5-TRIMETHYLBENZENE	0.4			125000	170000	MESITYLENE
111	2-ETHYLTOLUENE	0.3					*1-ETHYL-2-METHYLBENZENE*; O-ETHYLTOLUENE
112	1,2,4-TRIMETHYLBENZENE	0.4	100 (1)	1000 (A)	125000	170000	PSUEDOCUMENE
113	tert.BUTYLBENZENE	0.3					*(1,1-DIMETHYLETHYL)BENZENE*
114	tert.BUTYLCYCLOHEXANE	0.4					
115	1,3-DICHLOROBENZENE	0.8					
116	1-DECENE	1.3	180000 (3)	60000 (A)			n-DECYLENE
117	(CHLOROMETHYL)BENZENE	4.3					alpha-CHLOROTOLUENE; BENZYL CHLORIDE
118	1,5-DICHLOROPENTANE	0.3					
119	isoBUTYLBENZENE	0.3					
120	DECANE	0.5					*n-DECANE*
121	sec.BUTYLBENZENE	0.2					*(1-METHYLPROPYL)BENZENE*
122	3-(CHLOROMETHYL)HEPTANE	0.3					
123	1,2,3-TRIMETHYLBENZENE	0.4			125000	175000	HEMIMELLITENE
124	1ISOPROPYL4METHYLBENZENE	0.5					*METHYL(4-METHYLETHYL)BENZENE*; 3-ISOPROPYLTOLUENE; P-CYMENE
125	1,2-DICHLOROBENZENE	0.3					o-DICHLOROBENZENE
126	INDAN	0.5					*2,3-DIHYDRO-1H-INDENE*; 2,3-DIHYDROINDENE; HYDRINDENE
127	BUTYLCYCLOHEXANE	0.4					n-BUTYLCYCLOHEXANE; 1-CYCLOHEXYLBUTANE
128	1,3-DIETHYLBENZENE	0.4					m-DIETHYLBENZENE
129	1,4-DIETHYLBENZENE	0.5					p-DIETHYLBENZENE

130	BUTYLBENZENE	0.3			n-BUTYLBENZENE
131	1,2-DIETHYLBENZENE	0.5			o-DIETHYLBENZENE
132	transDECAHYDRONAPHTHALENE	0.3			t-DECALIN; BICYCLO[4,4,0]DECANE
133	cis-DECAHYDRONAPHTHALENE	0.3			c-DECALIN; BICYCLO[4,4,0]DECANE
134	UNDECANE	0.8			*n-UNDECANE*; HENDECANE
135	1235-TETRAMETHYLBENZENE	0.6			ISODURENE
136	1234-TETRAMETHYLBENZENE	0.6			PREHNITENE
137	1,3-DIISOPROPYLBENZENE	0.8			*1,3-BIS(1-METHYLETHYL)BENZENE*
138	1234TETRAHYDRONAPHTHALENE	0.6			TETRALIN
139	1,4-DIISOPROPYLBENZENE	0.8			*1,4-BIS(1-METHYLETHYL)BENZENE*; ISOPROPYLCUMENE
140	NAPHTHALENE	0.8	36 (3)	22.5 (A)	
141	DODECANE	1.3			*n-DODECANE*

NOTES:
(1) Standard
(2) Guideline
(3) Provisional Guideline
(4) Provisional Guideline for sum of o-, m-, & p-Xylenes

(A) Ambient Air Quality Criterion based on a 24-hour average concentration
(B) Ambient Air Quality Criterion based on a 1-hour average concentration
(please note; if the maximum 1-hour average concentration of a contaminant is LESS than the Criterion concentration based on a 24-hour average, then that Criterion has NOT been exceeded.)

TWA - Time Weighted Average for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed without adverse effect.

STEL - Short Term Exposure Limit - concentration to which workers can be exposed for a short period of time (15 minutes) without adverse effect.

* - Denotes name approved by the International Union of Pure and Applied Chemistry (IUPAC).

Table 2 ctd.

Characteristics of the Common Contaminants as Measured Continuously by MAMu's #1 and #2

All concentrations are in terms of ppm (parts per million)

	Detection Limits	Standards, Guidelines or Provisional Guidelines (1/2hr)	Criterion (1hr)	TWA	STEL		Alternate Names
1 SULPHUR DIOXIDE	0.005	(S) 0.300	0.25	2	5		SO_2 SULFUR DIOXIDE
2 TOTAL REDUCED SULPHUR	0.005	(P) 0.027 *	0.027	10	15	**	TRS
3 NITROGEN OXIDES	0.01	(S) 0.25 ***	N/A	-	-		NO_x OXIDES of NITROGEN
4 NITROGEN DIOXIDE	0.01	N/A	0.20	5	5		NO_2
5 NITRIC OXIDE	0.01	N/A	N/A	25	35		NO NITROGEN MONOXIDE
6 OZONE	0.01	(S) 0.1	0.08	0.1	0.3		O_3
7 CARBON MONOXIDE	0.1	(S) 5.0	30.0	50	400		CO

* As equivalent H_2S and applicable only for Kraft Pulp Mills
TRS may contain any of the following: Hydrogen Sulphide (H_2S), Methyl Mercaptan (CH_3SH), Dimethyl Sulphide (C_2H_6S) and Dimethyl Disulphide ($C_2H_6S_2$).

** The TWA and STEL for TRS is expressed solely for Hydrogen Sulphide concentrations

*** Expressed as NO_2

S = Standard; G = Guideline; P = Provisional Guideline

Table 3

BROCK WEST LANDFILL SITE '87 SURVEY

Monitoring Periods and Site Information - MAMu#2

Monitoring Period*	Start Time	Duration (hrs)	Site Location**	Comments
B242	15:12	1.2	PWC	Upwind data
B243	18:07	2.4	VFR	Manhole - Source data
B244	21:30	7.1	LPR	Overnight monitoring
B252	08:21	1.9	BWLS	On-site - downwind
B253	11:03	4.9	LPR	Background data
B254	17:19	1.3	BWLS	On-site - downwind
B255	21:40	7.8	LPR	Overnight monitoring
B262	07:27	9.3	PWC	Downwind - Landfill area
B263	16:53	12.2	PWC	Overnight monitoring
B272	05:49	2.6	PWC	Calm meteorological cdns.
B273	09:31	6.9	LPR	Calm meteorological cdns.
B276	18:17	58.8	PWC	Weekend monitoring
B303	09:01	9.0	LPR	Downwind - Landfill area
B304	18:22	10.8	LPR	Overnight monitoring
B312	05:40	1.2	LPR	Snow and Freezing Rain
B313	07:27	10.3	LPR	Snow and Freezing Rain
B314	17:43	3.5	LPR	Snow and Freezing Rain
B315	21:16	11.5	LPR	Overnight monitoring

* - in the designation of monitoring period Bxxy; 'B' refers to mobile air monitoring unit #2, 'xx' refers to day of the month, and 'y' refers to the data acquisition episode of the day.

** - in the designation of site location; 'PWC' refers to the Pickering Works Centre, 'VFR' refers to the Valley Farm Road site, 'LPR' refers to the Liverpool Road site and 'BWLS' refers to the Brock West Landfill site.

TABLE 4
COMMON CONTAMINANTS

Overall Average Ground Level Concentrations (units - ppm)

Monitoring Period	Duration (Hrs)	CO	TRS	THC	SO2	NOx	O3	Wind Spd. & Dir. *
B242	1.2	0.10	nd.	1.35	nd.	0.05	0.04	2507
B243	2.4	9.88	0.009	25.81	nd.	0.08	0.02	0502
B244	7.1	0.16	nd.	1.58	nd.	0.03	0.03	0101
B252	1.9	0.49	nd.	NA	nd.	0.07	0.02	1102
B253	4.9	0.65	nd.	NA	nd.	0.06	0.02	1305
B254	1.3	0.15	nd.	2.15	nd.	0.04	0.03	1018
B255	7.8	0.34	nd.	NA	nd.	0.03	0.02	2710
B262	9.3	0.48	nd.	NA	nd.	0.07	0.01	2410
B263	12.2	0.82	nd.	NA	nd.	0.10	0.01	2503
B272	2.6	0.88	nd.	NA	nd.	0.10	0.01	1900
B273	6.9	0.86	nd.	NA	0.014	0.08	0.01	1904
B276	58.7	0.51	nd.	NA	0.005	0.03	0.01	1003
B303	9.0	0.57	nd.	NA	nd.	0.04	0.01	3405
B304	10.8	0.18	nd.	1.36	0.006	0.01	0.01	3507
B312	1.2	0.20	0.003	NA	0.009	0.01	0.01	NA
B313	10.3	0.23	nd.	1.82	nd.	0.01	0.01	NA
B314	3.5	0.32	0.003	NA	nd.	0.01	0.01	NA
B315	11.5	0.60	0.002	NA	nd.	0.02	0.01	NA

Maximum One-Hour Average Ground Level Concentrations

Monitoring Period	CO	TRS	THC	SO2	NOx	O3
B242	0.11	nd.	1.36	nd.	0.05	0.04
B243	19.32	0.015	41.02	nd.	0.12	0.02
B244	0.20	nd.	1.58	nd.	0.04	0.04
B252	0.60	nd.	NA	nd.	0.07	0.02
B253	0.91	nd.	NA	nd.	0.08	0.04
B254	0.16	nd.	2.58	nd.	0.04	0.03
B255	0.59	nd.	NA	nd.	0.06	0.03
B262	1.03	nd.	NA	nd.	0.10	0.01
B263	1.32	nd.	NA	nd.	0.15	0.01
B272	1.03	nd.	NA	nd.	0.13	0.01
B273	1.18	nd.	NA	0.037	0.11	0.01
B276	2.09	nd.	NA	0.016	0.20	0.03
B303	1.97	nd.	NA	nd.	0.13	0.01
B304	0.25	nd.	2.88	0.012	0.01	0.01
B312	0.21	0.004	NA	0.010	0.01	0.01
B313	0.40	nd.	4.02	nd.	0.02	0.01
B314	0.35	0.003	NA	nd.	0.01	0.01
B315	2.03	0.003	NA	nd.	0.08	0.01

* - in the designation of wind speed and direction, the first two digits represent the wind direction to the nearest 10 degrees and the last two digits represent the wind speed in km/hr (ie. a 5 km/hr wind blowing from 244 degrees would be given as 2405).

nd. - not detected above detection limit of analyzer; for TRS, less than 0.002 ppm; for SO2 less than 0.01 ppm.

NA - data not available.

TABLE 5

DATA ACQUIRED AT THE PICKERING WORKS CENTRE   All units ug/m3 (micrograms per cubic metre)

	Monitoring Period	B242	B242	B242	B262	B262	B262	B262	B262	B262	B263	B263	B263	B263	B272	B272	B276	B276
	Date	MAR 24	MAR 24	MAR 24	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 27	MAR 27	MAR 27	MAR 27
	Start Time (1/2 hr Samples)	13:40	14:43	15:43	07:22	08:25	09:26	14:01	15:01	16:01	17:03	18:03	19:03	20:03	06:05	06:59	18:21	19:38
1	PROPANE	14.2	3.3	6.7	12.8	13.1	10.6	9.6	10.6	9.1	12.4	12.5	13.7	16.4	22.4	22.7	9.9	20.7
	PROPYNE				0.6	0.5								0.6				0.7
	2-METHYLPROPANE	3.4	1.8	3.6	10.9	13.9	8.4	7.4	4.9	5.4	9.1	8.0	9.0	14.0	14.4	15.8	8.1	10.2
	CHLOROETHENE														1.5	1.9		
	1-BUTENE	1.5		1.7	4.2		1.4				1.9		3.0			2.8		3.8
	BUTANE	11.1	4.3	8.7	19.5	11.6	9.0	8.3	8.5	8.9	12.5	13.8	18.8	27.8	24.5	22.1	18.9	24.7
	2-METHYLBUTANE	5.6	3.4	6.2	19.8	9.0	6.3	4.9	5.4	6.4	9.2	12.2	15.6	21.2	18.5	15.4	17.4	20.9
	1-PENTENE				1.1								0.7	1.0	1.1	0.7	1.0	0.9
	PENTANE	3.1	2.0	3.3	13.7	6.1	3.9	3.2	3.3	3.9	5.7	7.1	9.0	11.0	11.7	9.7	11.1	11.8
	TRANS-2-PENTENE				2.1	0.9					0.6	0.8	1.3	1.7	2.1	1.3	1.9	1.5
11	CIS-2-PENTENE				1.0								0.6	0.8	0.9	0.6	0.9	0.7
	DICHLOROMETHANE				6.6	15.8	11.5	5.1	3.4	4.2	5.9	5.1	4.0	6.1	8.3	8.9	5.2	4.4
	2-METHYL-2-BUTENE			0.6	2.5	0.9						1.0	0.8	2.0	2.0	0.8	2.6	0.7
	2,2-DIMETHYLBUTANE				1.0								0.7	0.9	1.0	0.9	1.0	1.0
	CYCLOPENTANE				1.5	0.7	0.5				0.7	0.8	1.1	1.4	1.5	1.2	1.7	1.6
	2,3-DIMETHYLBUTANE				2.1	1.0	0.7				0.8	0.9	1.3	1.7	1.7	1.4	1.7	2.1
	2-METHYLPENTANE	2.3	1.8	2.1	8.7	4.2	3.3	2.2	2.2	2.5	3.8	3.8	5.4	7.8	6.8	6.5	8.2	9.8
	3-METHYLPENTANE	1.4	1.1	1.5	6.9	3.9	2.7	1.7		1.9	2.9	2.8	4.5	6.3	6.0	5.1	5.8	7.8
	HEXANE	1.8	2.2	2.0	10.1	7.1	4.4	3.0	2.6	2.9	4.5	4.0	6.4	9.9	9.2	7.8	8.3	12.3
	TRICHLOROMETHANE					8.4						8.2			6.7		11.4	
21	METHYLCYCLOPENTANE			0.8	4.5	2.2	1.5	1.0	1.0	1.1	1.7	1.7	2.5	3.3	3.5	2.9	3.2	3.8
	1,1,1-TRICHLOROETHANE		2.6	2.6	3.2	5.5	4.0	3.0	2.4	2.8	4.1	4.7	4.4	7.2	4.3	5.1	3.5	5.0
	BENZENE	7.2	1.9	5.4	9.3	4.9	3.5	2.9	2.7	2.1	4.0	4.1	6.0	6.7	6.7	5.4	7.5	10.3
	TETRACHLOROMETHANE					5.1									5.1		5.4	
	CYCLOHEXANE				1.2	1.0	0.6				0.7	0.7	0.7	1.0	1.3	1.3	0.8	0.9
	2-METHYLHEXANE		0.7		3.5	2.3	1.4	1.0	0.8	0.9	1.5	1.6	2.4	2.8	3.4	2.7	3.1	3.2
	2,3-DIMETHYLPENTANE				1.5	1.2					0.9	0.9	1.3	1.6	1.7	1.4	1.6	1.8
	3-METHYLHEXANE		0.7	0.7	3.7	2.8	1.6	1.2	1.0	1.1	1.8	1.9	2.8	3.3	4.0	3.3	3.5	3.8

TABLE 5 cont.

DATA ACQUIRED AT THE PICKERING WORKS CENTRE

All units ug/m3 (micrograms per cubic metre)

Monitoring Period Date Start Time (1/2 hr Samples)	B242 MAR 24 13:40	B242 MAR 24 14:43	B242 MAR 24 15:43	B262 MAR 26 07:22	B262 MAR 26 08:25	B262 MAR 26 09:26	B262 MAR 26 14:01	B262 MAR 26 15:01	B262 MAR 26 16:01	B263 MAR 26 17:03	B263 MAR 26 18:03	B263 MAR 26 19:03	B263 MAR 26 20:03	B272 MAR 27 06:05	B272 MAR 27 06:59	B276 MAR 27 18:21	B276 MAR 27 19:38
TRICHLOROETHENE					14.5	5.4									4.1		
1-HEPTENE				1.1	0.8									1.0			
31 2,2,4-TRIMETHYLPENTANE				2.2	2.3	1.6	1.0	1.0	1.1	2.0	2.3	3.2	3.8	3.1	2.9	3.2	4.3
HEPTANE		0.7	0.6	3.3	3.0	1.7	1.4	1.2	1.2	2.2	2.2	4.6	3.8	4.3	3.8	3.3	3.3
METHYLCYCLOHEXANE				2.8	1.9	1.3	0.8	1.3	0.9	2.3	1.8	8.1	4.0	3.5	3.6	1.7	1.7
2,5-DIMETHYLHEXANE												0.8	0.7	0.7	0.6		0.6
1-CHLOROPENTANE				1.4						0.9		1.6	1.7	1.5	1.4		
TOLUENE	2.3	3.5	5.7	51.9	45.4	22.5	13.4	11.0	12.3	21.4	21.8	23.6	29.9	34.2	39.1	21.3	26.8
2-METHYLHEPTANE				2.1	1.5	0.9	0.7	1.3	0.6	1.9	1.1	5.7	3.2	2.4	2.4	1.3	1.4
4-METHYLHEPTANE														0.7	0.6		
3-METHYLHEPTANE				2.5	1.7	1.0		1.2		1.7	1.1	4.4	2.8	2.5	2.3	1.6	1.8
OCTANE			0.6	3.4	2.8	1.5	1.1	3.4	1.1	3.9	1.7	9.9	6.4	4.1	4.3	1.7	1.8
41 TRANS12DIMETHYLCYCLOHEXAN			0.7	3.7	3.1	1.6	1.2	3.7	1.2	4.3	1.8	12.3	7.0	4.4	4.7	1.9	1.9
ETHYLCYCLOHEXANE				1.2	1.4			1.7		1.2		3.5	2.0	1.1	1.2		
ETHYLBENZENE	2.0	1.9	3.6	5.2	5.5	3.6	2.4	2.6	2.2	5.0	3.6	4.3	7.2	7.0	8.2	3.9	5.4
M/P-XYLENES	6.0	5.2	10.1	18.3	15.4	10.3	5.9	7.4	5.3	12.8	9.3	14.4	17.7	17.0	20.7	10.2	16.1
4-METHYLOCTANE				3.1	1.8			1.1			0.7	2.3	2.0	1.6	1.6		0.8
2-METHYLOCTANE				3.1	1.7			1.1		1.3	0.7	2.3	2.0	1.5	1.6		0.8
3-METHYLOCTANE				3.3	1.8			1.1				2.3					
STYRENE				1.9	1.5	0.7				1.1	0.8	2.0	1.9	1.3	1.3	0.7	1.1
O-XYLENE	1.3	1.2	2.5	5.9	5.0	3.0	1.9	2.5	1.6	3.9	3.0	4.9	6.1	5.8	6.4	3.6	5.7
1-NONENE				2.5	1.5							1.3	1.3	1.1	1.2		
51 NONANE	1.4	1.5	1.7	21.0	10.5	2.9	1.9	4.6	1.4	4.4	2.1	7.1	7.4	6.1	6.6	1.5	2.3
PROPYLBENZENE										0.7		1.0	1.7		1.8	1.0	2.0
3-ETHYLTOLUENE	1.8		1.3	5.4	4.2	2.1	0.3	2.0		2.8	2.3	3.7	4.2	5.6	7.1	2.4	4.8
1,3,5-TRIMETHYLBENZENE				2.4	1.8	1.6				1.7		1.4	1.5	1.1	1.9		2.1
2-ETHYLTOLUENE				2.4	1.9							1.5	2.0	1.8	2.2	1.0	2.1

TABLE 5 cont.

DATA ACQUIRED AT THE PICKERING WORKS CENTRE

All units ug/m3 (micrograms per cubic metre)

Monitoring Period	B242	B242	B242	B262	B262	B262	B262	B262	B262	B263	B263	B263	B263	B272	B272	B276	B276
Date	MAR 24	MAR 24	MAR 24	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 26	MAR 27	MAR 27	MAR 27	MAR 27
Start Time (1/2 hr Samples)	13:40	14:43	15:43	07:22	08:25	09:26	14:01	15:01	16:01	17:03	18:03	19:03	20:03	06:05	06:59	18:21	19:38
1,2,4-TRIMETHYLBENZENE	2.8	1.1	2.7	7.5	5.3	3.6	0.8	2.3		3.2	1.8	5.1	4.8	3.4	4.7	1.9	7.2
DECANE	3.5	3.1	4.7	8.9	12.9	5.1	2.2	3.5	1.5	4.5	2.7	4.5	6.5	9.7	9.2	2.1	5.5
1,2,3-TRIMETHYLBENZENE			1.6	3.5		1.8						2.2		2.1			3.0
1ISOPROPYL4METHYLBENZENE				3.0	6.5	1.9		1.3		1.8	0.9	1.6	3.7	3.2	3.9		
BUTYLBENZENE				2.7	2.2							1.4			1.6		2.1
61 UNDECANE	4.5	3.8	6.0	10.2	15.0	5.5	1.8	3.2		4.4	1.9	5.5	6.4	7.0	8.2	2.6	6.7
DODECANE	2.7			4.8	3.5							2.0		3.7	2.5		2.2
Total Compounds Identified	21	22	28	57	53	40	30	35	27	45	42	57	53	58	58	45	52
Area % Identified Peaks	81	80	87	79	79	86	86	81	84	81	86	78	81	83	83	85	87
Total Hydrocarbons ug/m3	79.9	47.7	87.3	347.6	298.3	154.8	91.2	107.2	83.7	174.3	160.3	264.8	298.8	314.4	312.7	210.4	277.4
Alkanes ug/m3	55.0	30.3	48.3	181.9	134.6	72.2	52.5	62.0	50.0	91.5	86.2	145.2	169.6	172.4	161.4	115.9	161.2
Cycloalkanes ug/m3	0.0	0.0	1.4	15.0	10.4	5.5	3.0	7.6	3.2	10.9	6.8	28.1	18.6	15.3	15.0	9.2	9.9
Alkenes ug/m3	1.5	0.0	2.2	14.5	4.1	1.4	0.0	0.0	0.0	2.6	1.8	8.6	7.5	8.2	7.5	6.4	7.5
Cycloalkenes ug/m3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkynes ug/m3	0.0	0.0	0.0	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.7
Aromatics ug/m3	23.4	14.8	32.8	119.4	99.5	54.8	27.5	31.7	23.5	58.4	47.6	73.0	87.4	89.2	104.4	53.4	88.7
Chlorinated Alkanes ug/m3	0.0	2.6	2.6	11.2	34.7	15.5	8.1	5.7	7.0	10.9	18.0	10.0	15.1	25.9	15.4	25.5	9.4
Chlorinated Alkenes ug/m3	0.0	0.0	0.0	5.2	14.5	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	9.0	0.0	0.0
Chlorinated Aromatics ug/m3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Benzene:Ethylbenzene	3.6	1.0	1.5	1.8	0.9	1.0	1.2	1.0	0.9	0.8	1.1	1.4	0.9	1.0	0.7	1.9	1.9
Toluene:Ethylbenzene	1.1	1.8	1.6	9.9	8.2	6.2	5.7	4.2	5.6	4.3	6.0	5.4	4.2	4.9	4.8	5.4	5.0
Xylenes:Ethylbenzene	3.7	3.4	3.5	4.6	3.7	3.7	3.3	3.8	3.1	3.3	3.4	4.4	3.3	3.3	3.3	3.5	4.0

Table 6

Monitoring Period	B244	B273	B303	B304	B304	B313	B313	B314	B314	B314
Date	MAR 25	MAR 27	MAR 30	MAR 30	MAR 30	MAR 31	MAR 31	MAR 31	MAR 31	MAR 31
Start Time (1/2 hr Samples)	04:46	16:24	08:33	17:52	20:17	07:31	08:31	17:34	18:45	20:04
1 PROPANE	12.6	14.5	7.6	3.8	3.6	2.3	2.5	2.8	2.7	
PROPYNE		0.5								
2-METHYLPROPANE	3.4	10.9	9.4	1.9	1.5	0.9	1.2	0.8	1.0	
CHLOROETHENE										
1-BUTENE		3.4	4.2							
BUTANE	5.8	21.9	26.5	1.9	1.9	2.0	1.7	2.1	2.6	
2-METHYLBUTANE	3.5	17.9	23.9	1.2	1.2	1.5	1.1	1.9	2.3	
1-PENTENE		0.8	1.3							
PENTANE	2.1	9.9	14.1	0.8	1.0	1.0	0.8	1.2	1.5	0.5
TRANS-2-PENTENE		1.3	2.6							
11 CIS-2-PENTENE		0.7	1.3							
DICHLOROMETHANE	6.5									
2-METHYL-2-BUTENE			3.1							
2,2-DIMETHYLBUTANE		0.8	1.0							
CYCLOPENTANE		1.6	2.2							
2,3-DIMETHYLBUTANE		1.5	1.9							
2-METHYLPENTANE	1.7	7.2	9.0	0.6	1.0	0.8	0.5	0.9	1.1	1.3
3-METHYLPENTANE	1.3	5.1	6.0		0.6			0.6	0.7	0.8
HEXANE	2.1	7.3	7.7	0.7	1.5	0.7		0.8	1.0	1.0
TRICHLOROMETHANE										
21 METHYLCYCLOPENTANE	0.7	2.8	2.9							
1,1,1-TRICHLOROETHANE		3.5								
BENZENE	2.4	8.8	5.7	2.6	2.0	1.8	1.7	2.0	1.9	2.7
TETRACHLOROMETHANE										
CYCLOHEXANE		0.7								
2-METHYLHEXANE	0.8	2.6	2.6		1.3					
2,3-DIMETHYLPENTANE		1.4	1.3							
3-METHYLHEXANE	0.9	3.0	2.8		1.5					
TRICHLOROETHENE										
1-HEPTENE										
31 2,2,4-TRIMETHYLPENTANE	0.7	3.4	2.7							
HEPTANE	0.9	2.8	2.3		1.5					
METHYLCYCLOHEXANE		1.8	0.9							
2,5-DIMETHYLHEXANE										
1-CHLOROPENTANE										
TOLUENE	9.6	22.2	12.6	2.7	4.5	1.9	1.1	1.3	2.5	2.3
2-METHYLHEPTANE		1.5	0.7							
4-METHYLHEPTANE										
3-METHYLHEPTANE		1.6	1.1							
OCTANE	0.7	2.1	0.8							

Table 6 cont.

Monitoring Period	B244	B273	B303	B304	B304	B313	B313	B314	B314	B314
Date	MAR 25	MAR 27	MAR 30	MAR 30	MAR 30	MAR 31	MAR 31	MAR 31	MAR 31	MAR 31
Start Time (1/2 hr Samples)	04:46	16:24	08:33	17:52	20:17	07:31	08:31	17:34	18:45	20:04
41 TRANS12DIMETHYLCYCLOHEXAN	0.7	2.3	0.8							
ETHYLCYCLOHEXANE		0.8								
ETHYLBENZENE	1.8	5.0								
M/P-XYLENES	5.1	15.3				0.7		0.9	0.9	1.4
4-METHYLOCTANE		0.7								
2-METHYLOCTANE		0.7								
3-METHYLOCTANE										
STYRENE		0.8								
O-XYLENE	1.4	5.2								
1-NONENE										
51 NONANE		1.9	3.7							
PROPYLBENZENE		1.5								
3-ETHYLTOLUENE	1.2	4.0								
1,3,5-TRIMETHYLBENZENE		1.8								
2-ETHYLTOLUENE		1.7								
1,2,4-TRIMETHYLBENZENE	1.4	6.0								
DECANE	1.3	3.9	5.2							
1,2,3-TRIMETHYLBENZENE		2.8								
1ISOPROPYL4METHYLBENZENE										
BUTYLBENZENE		1.4								
61 UNDECANE		4.5	1.6							
DODECANE		2.1	2.2							
Total Compounds Identified	26	51	34	10	14	11	9	12	12	8
Area % Identified Peaks	80	86	82	72	77	73	75	74	77	78
Total Hydrocarbons ug/m3	68.5	227.3	171.6	16.3	23.2	13.4	10.6	15.2	18.2	9.9
Alkanes ug/m3	37.7	129.1	133.9	11.0	16.6	9.0	7.7	11.0	12.9	3.5
Cycloalkanes ug/m3	1.5	10.0	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkenes ug/m3	0.0	6.2	12.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycloalkenes ug/m3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkynes ug/m3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aromatics ug/m3	22.8	77.9	18.3	5.2	6.6	4.5	2.9	4.2	5.3	6.4
Chlorinated Alkanes ug/m3	6.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorinated Alkenes ug/m3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chlorinated Aromatics ug/m3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 7

All units ug/m^3 (micrograms per cubic metre)

DATA ACQUIRED @ THE MANHOLE ON VALLEY FARM ROAD

		B243 MAR 24 18:02	B243 MAR 24 19:39
1	PROPANE	11.6	21.5
	PROPYNE	0.6	
	2-METHYLPROPANE	82.0	66.8
	CHLOROETHENE	2.7	3.2
	1-BUTENE	29.3	
	BUTANE	199.4	186.2
	3-METHYL-1-BUTENE	6.0	9.1
	2-METHYLBUTANE	164.7	182.9
	1-PENTENE	9.0	12.7
	PENTANE	101.4	120.2
11	2-METHYL-1,3-BUTADIENE	2.7	15.4
	TRANS-2-PENTENE	20.8	24.0
	CIS-2-PENTENE	10.0	11.9
	DICHLOROMETHANE	4.2	
	2-METHYL-2-BUTENE	33.6	35.8
	2,2-DIMETHYLBUTANE	8.0	10.9
	CYCLOPENTANE	13.1	18.1
	2,3-DIMETHYLBUTANE	15.5	23.1
	2-METHYLPENTANE	64.1	97.8
	3-METHYLPENTANE	52.6	83.0
21	1-HEXENE	1.9	7.4
	cis-1,2-DICHLOROETHENE	10.4	
	2-CHLOROBUTANE	10.7	12.5
	HEXANE	66.0	112.8
	TRANS-3-HEXENE	2.5	4.0
	METHYLCYCLOPENTANE	22.2	40.6
	1,1,1-TRICHLOROETHANE	2.8	
	BENZENE	27.6	129.5
	TETRACHLOROMETHANE	24.9	59.9
	CYCLOHEXANE	3.1	6.9
31	2-METHYLHEXANE	20.5	47.7
	2,3-DIMETHYLPENTANE	10.4	24.8
	3-METHYLHEXANE	22.6	56.3
	2,2,4-TRIMETHYLPENTANE	14.2	43.2
	HEPTANE	15.2	46.4
	1-CHLORO-3-METHYLBUTANE	1.6	
	TRANS-2-HEPTENE	1.0	2.8
	METHYLCYCLOHEXANE	4.6	14.9
	2,5-DIMETHYLHEXANE	2.1	7.7
	1-CHLOROPENTANE	1.9	7.0
41	TOLUENE	146.1	260.7
	2-METHYLHEPTANE	4.6	18.9
	4-METHYLHEPTANE	1.7	6.3
	3-METHYLHEPTANE	6.6	26.2
	OCTANE	3.8	18.6

DATA ACQUIRED ON-SITE

		B252 MAR 25 09:02	B254 MAR 25 17:14
1	PROPANE	11.8	9.0
	2-METHYLPROPANE	33.4	1.4
	1-BUTENE	5.9	
	BUTANE	74.1	3.7
	2-METHYLBUTANE	39.9	2.3
	1-PENTENE	1.8	
	PENTANE	22.9	1.2
	TRANS-2-PENTENE	3.7	
	CIS-2-PENTENE	1.7	
	2-METHYL-2-BUTENE	5.6	
11	2,2-DIMETHYLBUTANE	1.5	
	CYCLOPENTANE	2.7	
	2,3-DIMETHYLBUTANE	2.4	
	2-METHYLPENTANE	9.9	0.9
	3-METHYLPENTANE	7.8	0.5
	HEXANE	9.9	0.9
	METHYLCYCLOPENTANE	3.0	
	1,1,1-TRICHLOROETHANE	4.1	
	BENZENE	4.7	1.9
	2-METHYLHEXANE	2.8	
21	2,3-DIMETHYLPENTANE	1.5	
	3-METHYLHEXANE	3.2	
	TRICHLOROETHENE	3.9	
	2,2,4-TRIMETHYLPENTANE	2.1	
	HEPTANE	2.5	
	METHYLCYCLOHEXANE	1.0	
	TOLUENE	19.1	2.5
	2-METHYLHEPTANE	0.7	
	3-METHYLHEPTANE	1.0	
	OCTANE	0.8	
31	TRANS12DIMETHYLCYCLOHEXAN	0.9	
	ETHYLBENZENE	2.6	1.1
	M/P-XYLENES	7.8	3.3
	O-XYLENE	2.4	0.9
	DECANE	1.3	
	UNDECANE	2.4	
	Total Compounds Identified	38	14
	Area % Identified Peaks	89	73
	Total Hydrocarbons ug/m3	304.0	29.4
	Alkanes ug/m3	231.7	19.8
	Cycloalkanes ug/m3	7.6	0.0
	Alkenes ug/m3	20.2	0.0
	Cycloalkenes ug/m3	0.0	0.0

Table 7 cont.

All units ug/m³ (micrograms per cubic metre)

DATA ACQUIRED @ THE MANHOLE ON VALLEY FARM ROAD

	B243 MAR 24 18:02	B243 MAR 24 19:39
TRANS12DIMETHYLCYCLOHEXAN	4.1	20.4
ETHYLBENZENE	36.8	70.9
M/P-XYLENES	98.2	212.0
4-METHYLOCTANE		10.4
2-METHYLOCTANE		10.2
51 3-METHYLOCTANE	1.3	
STYRENE		8.8
O-XYLENE	34.6	
NONANE		7.6
ISOPROPYLBENZENE	1.9	
PROPYLBENZENE	4.4	
3-ETHYLTOLUENE	15.1	5.0
4-ETHYLTOLUENE	4.7	
1,3,5-TRIMETHYLBENZENE	9.0	
2-ETHYLTOLUENE	6.3	
61 tert-BUTYLBENZENE		2.6
1,2,4-TRIMETHYLBENZENE	22.9	
DECANE	2.4	
1,2,3-TRIMETHYLBENZENE	10.7	
1ISOPROPYL4METHYLBENZENE	12.3	
INDAN	3.1	
BUTYLBENZENE	5.1	
UNDECANE	2.9	
1235-TETRAMETHYLBENZENE	4.2	
1234-TETRAMETHYLBENZENE	5.7	
71 DODECANE	2.9	
Total Compounds Identified	69	50
Area % Identified Peaks	90	65
Total Hydrocarbons ug/m3	1550.6	2225.2
Alkanes ug/m3	876.4	1229.3
Cycloalkanes ug/m3	47.2	100.9
Alkenes ug/m3	116.7	123.0
Cycloalkenes ug/m3	0.0	0.0
Alkynes ug/m3	0.6	0.0
Aromatics ug/m3	448.8	689.5
Chlorinated Alkanes ug/m3	46.0	79.3
Chlorinated Alkenes ug/m3	14.9	3.2
Chlorinated Aromatics ug/m3	0.0	0.0
Benzene:Ethylbenzene	0.8	1.8
Toluene:Ethylbenzene	4.0	3.7
Xylenes:Ethylbenzene	3.6	3.0

DATA ACQUIRED ON-SITE

	B252 MAR 25 09:02	B254 MAR 25 17:14
Alkynes ug/m3	0.0	0.0
Aromatics ug/m3	36.4	9.5
Chlorinated Alkanes ug/m3	4.1	0.0
Chlorinated Alkenes ug/m3	3.9	0.0
Chlorinated Aromatics ug/m3	0.0	0.0
Benzene:Ethylbenzene	1.8	1.8
Toluene:Ethylbenzene	7.5	2.4
Xylenes:Ethylbenzene	4.0	3.9

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